Billing Method in a Telecommunications System

The present invention relates to a billing method in a telecommunications system. Particularly, but not exclusively, the present invention relates to a billing method, which can be executed with a SIM card, as well as to a corresponding SIM card.

The present invention follows from the observation that fees charged for using resources in a telecommunications network can be divided into three layers (Figure 1).

Located in the lowest layer L are the license fees, which must be paid to different licensers for the usage of protected hardware and software resources. Each resource in a telecommunications system can be subject to license fees. Generally, the network operator pays these license fees to the licenser; however, the end user only pays this license fee indirectly through traffic fees paid to the network operator.

Located in the middle layer T are the traffic fees. This layer relates to the regular telecommunication fees, which are paid to the network operator by a user of the telecommunications network, for example for a conversation or a data transmission. In conventional systems, this billing process is executed in a central unit in the network. Nevertheless, pre-paid-systems are known, in which this process can take place in a chipcard of the user, for example. In the GSM mobile radio network, for instance, a service known as advice of charge (AOC) is used for determining the traffic fees. Moreover, another system is described in the patent document EP656733.

Described in the patent application WO 97/40616 is a method, a smart card and a system which makes it possible for users to use wireless telephones anonymously, and to carry out payment for the telephone calls without subscriptions. This is achieved, according to WO 97/40616, in that an expanded SIM card of the telephone can cooperate with a prepaid card, the

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SIM card being able, in particular, to receive the number of remaining prepaid units from the prepaid card and, if applicable, being able to admit the telephone in the network, after security checks have been carried out and if there are sufficient prepaid units. The fees for telephone calls can be determined with
5   reference to tariff tables stored in the SIM card and the call duration measured in the telephone, units being subtracted from the units stored in the prepaid card in accordance with the determined fees.

The top layer S relates to the service fees. These fees are charged for the use of services, which are not offered by the network operator. Mostly,
10   these fees are billed and collected by different service providers for different services, which are not directly related to the traffic process.

According to the invention, these different groups of fees are determined and billed separately and independently.

Preferably, the billing process for determining and billing these three
15   layers of fees is executed in the SIM card of the user.

The billing method according to the invention for billing the usage of resources not related to the traffic process is performed by means of a counter in the SIM card, which counter is incremented each time this resource is used. The amount to be billed is determined based on the value of the counter and
20   charged to the user.

Software resources as well as hardware resources can be billed by means of this method. For example, one or more fees can be charged in the SIM card for the usage of contactless interfaces. It is also possible to bill for resources, which are responsible for using the SIM card as an identification
25   card in another system. Furthermore, more than one resource in the SIM card can be billed for independently.

The billed amount can depend on the number of times of use and/or

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on the duration of the usage of a specific resource.

This method can be used, for instance, to determine and to charge a license fee for the usage of a resource protected by a patent. But it is also possible to bill for the use of resources offered by an external service provider.

5 The billed amount can be debited from a pre-paid account of the SIM card. In a variant, a billing record with the billed amount is prepared and transmitted to a sub-fee collector (SFC) in the telecommunications network. Preferably, this transmission only takes place when the value of the counter exceeds a pre-defined amount. Preferably, these billing records are transmitted 10 via said telecommunications network by means of special SMS-messages.

Preferably, the billed amount depends on a fee table stored in the SIM card. Preferably, this table can be added to or changed by the service provider or the licenser, respectively, or by the network operator.

The invention makes it possible to collect license fees directly at the 15 end user instead of at the network operator. New types of licensing agreements can be set up therewith. The method according to the invention offers more transparent billing for the user, and it is more flexible for the licenser or the service provider. Moreover, the invention enables billing that is more just because frequent users pay more fees than users who never or rarely use a 20 specific resource.

Furthermore, the method according to the invention has the advantage that, through the multilayer model, different service providers and licensers can freely offer and bill for their services with different processes. Moreover, the method makes it possible to significantly lower costs because all 25 the processes mentioned can run fully automatically.

The present invention will be better understood with the aid of the

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description, given by way of example and illustrated by means of the appended figures:

Figure 1 shows the layer structure of billing.

Figure 2 shows a block diagram of a system according to the

5   invention.

Reference numeral 1 relates to a terminal device, for example a GSM mobile radio telephone or a computer with communications possibilities. The device 1 contains a SIM card 10 (Subscriber Identity Module) which identifies the user in the telecommunications network 2. SIM cards are currently

10   being used in GSM-, DCS-, or PCS mobile devices, among others, or also in future fixed networks with user identification through chipcards. The SIM card can be either a full-size card or a plug-in card. It is connected to the terminal device 1 by means of a contact area on the surface of the card. The SIM card 10 contains data processing means 100, for example a known GSM SIM-

15   processor. SIM cards are described, for instance, in the technical specifications GSM 11.11 or GSM 11.14, available since 1995 or 1996, respectively, at the office of the European Telecommunications Standards Institute, in F-06921 Sophia Antipolis.

A memory area, preferably an EEPROM, is contained in the

20   processor 100 or connected to this processor. The memory area contains programs and data files, which are organized in a hierarchical directory structure. Among others, the data files include elementary files EF as defined in the above-mentioned technical specifications GSM 11.11 or GSM 11.14.

Moreover, the SIM card contains known means for sending and

25   receiving SMS short messages, as well as preferably known filter means for recognizing and temporarily storing short messages, preferably according to the SICAP method described in the patent EP 0689 368 B1, among others. Furthermore, there are preferably encryption means and signing means in

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order to decrypt received SMS-messages and encrypt and sign SMS-messages sent. For example, the trusted third party (TTP) method can be used as an encryption method, or decryption means working according to a point-to-point method can be used.

5   Furthermore, the SIM card contains one or more resources for the usage of which one or more fees must be paid. For example, a resource may be a new software application being stored in the memory area of the processor 100, or new hardware resources expanding the functionality of the SIM card 10, or a combination of software and hardware elements. In the

10   illustrated example, the SIM card contains an inductive interface D (for instance a coil) by means of which the SIM card can communicate with external devices 8 in a contactless manner. For example, the external device 8 may be an access control system or a transaction system (point of sale, POS). Another electronic module 101, connected to the inductance coil and responsible for the

15   contactless communication with the external device 8, is preferably added to the SIM-microcontroller 100. Thereby, the SIM card 10 in the mobile device 1 can communicate via the inductive interface D with the external device 8. In a variant, the casing of the mobile device 1 comprises an infrared interface E, by means of which the card 10 can communicate with other external devices 9.

20   As another possible new resource, a new additional table with identification parameters 1000 can be provided, for example, by means of which table the SIM card can be used as an identification card in other systems, for instance in a pay-TV or pay-radio system 13, in a computer network 11, and/or in further systems 12.

25   License fees, traffic fees, and/or service fees must be paid for the usage of the following resources in the illustrated SIM card 10:

- Communication via the GSM network (A-B).   Not resource ujle card

-   Interface (B-C) between the SIM-processor 100 and the

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communication processor 101.

- Inductive interface C-D between the SIM card 10 and an external device 8.

- Infrared interface C-E between the terminal device 1 and an external device 9.

- Identification table for other systems for using the SIM card 10 as an identification card in other systems (interface B-F).

However, the invention is not limited to the billing of these special new resources; it can also be used for billing in the SIM card for any possible resource offered by external service providers 3 or licensers. A software resource corresponding to a new service can be selected by the user, for instance from a catalogue, from the Internet, etc., and can be loaded into the SIM card of the user by means of special short messages. The service provider will then be paid for the usage of this service by means of the method according to the invention. With this method, it is even possible to bill for the usage of resources outside of the SIM card, for example, in the mobile device 1 or even in an external device 11 to 13 not permanently connected to the SIM card. In this latter case, it is necessary to transmit the usage parameters, for instance the number of times or duration of use, to the SIM card when the card is connected to this external device.

According to the invention, the SIM card 10 additionally contains one or more counters 1002, 1002'. Each counter corresponds to one or more resources to be billed for, and is incremented each time these resources are used. The counters may contain hardware and/or software means. In a preferred variant, however, each counter comprises a data file (elementary files EF) in the memory area of the SIM-processor 100, as well as an incrementation program, preferably a new EXE-file in the same memory area, which program

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increments this data file when the corresponding resource is used. The counters can be a part of the resource. For example, if the resource is a software resource, it can determine itself how many times it has been used and what fees have to be paid.

5   The usage of a specific resource may be subject to more than one fee, specifically, a license fee, a traffic fee, and a service fee. In general, these different fees are paid to different recipients. The license fee is determined for a licenser, the traffic fee is determined for a network operator, and the service fee is determined for a service provider. Thus, for each resource, a plurality of
10   counters can be used, corresponding to different fees.

The amount of the fee charged for the usage of a specific resource can depend on the number of times of use or on the duration of the use. In this latter case, the counter value increases per pre-defined time period while this resource is being used, for instance per minute.

15   In principle, license fees to be charged for the usage of a specific resource in the card are predetermined; however, specific users may profit from a special tariff. In contrast, the amounts for traffic fees and for service fees are preferably dependent on the service. These different amounts, dependent on the user and/or on the service, are stored in a fee table 1001 in the SIM card,
20   which table, as will be explained later, can be set, changed, added to, or deleted from another location in the telecommunications network. Service-dependent fees can thereby be charged.

When the SIM card 10 is inserted in the terminal device 1, it is connected via an interface A to a telecommunications network 2, for example a
25   GSM network. A SIM server 4 is also connected to the network 2, and comprises a short message service center (SSC) 41 for administering short messages. The SSC unit 41 is equipped in such a way that it can communicate with the SIM card 10 by means of special SMS short messages via the network 2. Known filter means in the central unit 41 and in the SIM cards 10 make it

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possible to execute special services, for example exchanging data files, instructions, and programs between the SIM server and a SIM card. The SIM server 4 preferably contains in addition a TTP server 40 in order to encrypt and sign the communications between the central unit 41 and the SIM cards 10 in

5 the network. Thereby ensured are the confidentiality, the authenticity of the identity, the authenticity of the information, the integrity, and the indisputability of the origin of the different messages. Nevertheless, a point-to-point encryption and signing method can also be used.

The network operator and/or the various service providers and

10 licensers can add to or adapt the fee table 1002 in the already distributed SIM cards by means of encrypted special SMS short messages. A change of tariffs can then be carried out in an easy manner in that these fee tables in the SIM cards are adjusted as already described in the patent application EP734144. Similarly, the fees charged are transmitted to the recipients by means of SMS

15 messages, as will be explained further below.

Furthermore, the SIM server 4 comprises at least a sub-fee collector (SFC) 42 in which the different collected fees are temporarily stored and processed. A different sub-fee collector is provided for each network operator, who is also provided with a SIM server.

20 The SIM server 4 is connected to different main fee collectors (MFC) 6, 6', 7, 7' via a network 5, for example via an internet, intranet, extranet, or a X.25 network. These main fee collectors are operated by different licensers and service providers. They comprise servers which query the amounts intended for them, which were received and sorted by the sub-fee collectors, and they pass

25 these amounts on to an accounting system (not illustrated), for example a bank or a financial institution. The communication between the SFC's and the MFC's are signed and preferably additionally encrypted.

When a resource is used, for instance one of the above-mentioned resources subject to one or more fees, the corresponding counter is

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incremented. The increment value may be fixed or it may depend on the duration of the usage, for example, or on other parameters, for example time of day, day of the week, location, user category, etc. The increment value may also depend on the fee table 1002. Moreover, the usage of one single resource

5 may cause more than one counter to increment, for example a first counter for the license fees, a second counter for the traffic fees, and a third counter for the service fees.

The charged fee amounts are sometimes very small; specifically, the amount for license fees charged for the usage of a specific resource in the card can be small. In order to avoid a great number of transactions with small amounts, these amounts are preferably not immediately charged to the users. For that purpose, the amount counted by the counter is compared to a pre-defined amount stored in the card, and it is only charged when the amount counted by the counter exceeds the pre-defined amount. If the fee table is not

15 taken into consideration in the incrementation step, this counted amount is turned into a billing record using the fee table 1002.

SIM cards containing a pre-paid amount of money are already known in general in the GSM area. These cards can be reloaded in that an amount of money is paid to the network operator. In these cards, the fees intended for the

20 network operator can be deducted directly from this stored amount of money.

However, most of the fees are not charged to an account inside the card. Instead, a billing record with the amount to be billed is prepared and transmitted to a sub-fee collector of the SIM server 1 <sic. 4 > during or after usage. However, a billing record is preferably only prepared and transmitted

25 when the counter value exceeds the pre-defined amount or only after a pre-defined number of times of use. In a variant, this billing record is not sent by the card 10, but periodically queried by the sub-fee collector 42.

The transmitted billing records can be adapted depending on the service, and they contain the following information, for example: transmitted

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amount, user, recipient, pre- or post-paid-process, location, time, etc. As one skilled in the art will recognize, more than one amount, corresponding to more than one counter 1002, 1002', can be grouped and transmitted in one single billing record.

5   The sub-fee collector 42 receives the billing records from different SIM cards 10 in the network 2, and sorts these records by recipient. The recipient may be a licenser or a service provider who operates a main fee collector 6, 6' or 7, 7', respectively, or he may be the operator of the telecommunications network 2. However, even in the case of a license fee or a

10   service fee, a portion of the transmitted amount of money is preferably assigned to the network operator, and only a portion is passed on as a license or service fee.

The amounts sorted and processed by the sub-fee collector 42 are forwarded via the network 5 to the corresponding main fee collector 6, 6', 7, 7'

15   of the respective financial institution. These amounts can either be sent out periodically or be prepared for querying by the main fee collectors.

Main fee collectors may be used for all types of fees. For example, different fees depending on the service, the type of traffic (voice, data, multimedia), or the type of license may be collected by the responsible

20   collector.

It is also possible to transmit the billing records to the recipient via the contactless interface D or E. In this case, the recipient must be connected to the external device 8 or 9, respectively.

As already mentioned, the already generally known TTP method for signing

25   and encrypting transmitted data and messages is used in the system.

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